

# UNITED STATES PATENT OFFICE

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## METHOD OF HARDENING.

No. 812,442.

Specification of Letters Patent.

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*To all whom it may concern:*

Be it known that I, WILLIAM E. NICKERSON, a citizen of the United States, and a resident of Cambridge, in the county of Middlesex and State of Massachusetts, have invented a new and useful Method of Hardening, of which the following is a specification.

My invention relates to the art of hardening steel, and is intended to provide a simple and practical method of hardening simultaneously and quickly a large number of thin strips or sheets of limited area.

My method has a special applicability to the hardening before sharpening of the thin flat steel blades employed in the safety-razor shown and described in United States Letters Patent No. 775,134, granted on the 15th day of November, 1904, on the application of King C. Gillette and will be so described herein; but my invention is not limited to such use.

In hardening steel sheets which are as thin as are the blades above referred to it is important to protect the surfaces of the sheets from contact with air while being heated, and especially from contact with the water of the chilling-bath when plunged therein while hot, in order to prevent the oxidation of the sheets which would result from such contacts and would be likely to penetrate the sheets to such an extent as to greatly injure them or render them useless. It has been proposed to protect these blades from such contact by piling them in a compact stack and heating them collectively and subsequently hardening them simultaneously by plunging them in a cold bath; but this process has been found to be impracticable, however, for the reason that the cold liquid which is applied to the stack comes in contact with the surface of the stack only, or, in other words, with the edges only of the blades, with the result that each blade has its edges or rim set while the inside portion is still very hot, and thus the hardened rim becomes slack and is caused to crinkle or become wavy when the blade is finally cooled to a uniform temperature throughout, thus destroying the straightness of the edges of the blade beyond restoration and leaving the center unhardened.

According to my invention I pile a number of the blades in a stack; but instead of placing them all directly in contact one with an-

other I interleave between each few blades, and preferably between adjacent blades throughout the stack, a sheet of some metal, such as copper or silver, which is a much better conductor of heat than is steel and has a melting-point high enough to resist the temperature to which the steel blades are heated for hardening, copper being preferred. These sheets are preferably of such size that they will project slightly beyond the edges of the adjacent blades all the way around. This stack of blades with the sheets interleaved is then hardened by the application of a cold liquid thereto, and the result is that the sudden change of temperature, instead of being effective at the edges or rims only of the blades, is made to occur with sufficient quickness to become effective over the entire area of the blades through the medium of the interleaved sheets, through which the heat of the blades passes away much more rapidly than it could have done through the blades themselves. This result is facilitated in case the edges of the sheets project slightly beyond the edges of the blades, because the projecting edges of the sheets in this case tend to keep the water or other liquid from circulating in direct and immediate contact with the edges of the blades and also expose a greater surface of the interleaved sheets to the action of the liquid, so that the loss of heat occurs at a practically uniform rate throughout the entire extent of each blade.

I have found that in the manner above described I can harden a large number of blades at once without causing them to lose their original flatness to any extent sufficient to interfere with their proper use.

In hardening the blades in stacks as above described the stack of blades and interleaved sheets should be subjected to a powerful chilling action, as by the use of a current or stream of water or of a bath of ice-water or of cold brine. After having been hardened the blades are drawn to a cutting-edge temper, preferably by means of an oil-bath at the proper temperature.

In the accompanying drawings I have illustrated an apparatus useful in practicing my method, in which—

Figure 1 is a front elevation of the hardening apparatus with a portion thereof broken away. Fig. 2 is a central vertical section